

THE LORANTHACEAE OF AUSTRALIA. PART VII.

By W. F. BLAKELY, Assistant Botanist, National Herbarium, Sydney.

(Plates i-ix.)

[Read 28th March, 1928.]

II. 1. VISCOIDEAE-KORTHALSELLINEAE.

Engler, Engl. et Prantl., *Pflzfam.*, Nachtr., 1897, 137; *Bifariées* Van Tiegh., *Bull. Soc. bot. France*, xliii, 1896, 162.

Perianth single. Flowers unisexual. Placenta central; embryo-sac oblong or U-shaped. Anthers two-celled, usually dehiscent by a terminal orifice in the Australian species.

5. KORTHALSELLA Van Tiegh.

Bull. Soc. bot. France, xliii, 1896, 83; Engler, Engl. et Prantl., Nachtr., 138.

Flowers unisexual. Calyx absent or inconspicuous. Corolla regular. Male flowers trimerous, the petals persistent, valvate, triangular, concave and somewhat gibbose. Anthers (3), forming a sessile globose mass in the centre of the perianth, two-celled, usually dehiscent by a single central pore. Female flowers trimerous, the petals persistent, regular, valvate, incurved in all the Australasian species. Ovary inferior; style very short, included; stigma thick, pulvinate. Fruit baccate, viscid, pear-shaped or ellipsoid, crowned by the petals. Seeds albuminous; embryo 1, rarely 2, terete or compressed; cotyledons membranous, unequal. Leafless parasitic shrubs; branches opposite, nodose, the internodes angular, terete, or broadly compressed, nerveless or venulose. Leaves reduced to microscopic stipular scales. Inflorescence axillary, consisting of a simple floral band forming a cushion-like receptacle on the shoulders of the internodes. Flowers usually surrounded for nearly half their length by moniliform, crystalline, variously coloured cilia.

The common Australian species, formerly known as *Viscum articulatum* Burm., is included under *Pseudixus japonicus* by Hayata (*Ik. Pl. Form.*, v, 1915, 187).

In the absence of the original description of *Korthalsella* Van Tiegh., and *Bifaria* Van Tiegh., I have decided to follow Engler and take up the name *Korthalsella* in preference to *Pseudixus* Hayata, as the disposition of the anthers is not quite clear to me. Apparently Hayata is also dubious as to their arrangement, for he says "*Bifaria* seems to have male flowers with stamens opposite to the perianth-lobes, as is the case with *Korthalsella*".

Assuming that Van Tieghem had inaccurately described the anthers of *Korthalsella* or *Bifaria*, it would not be admissible on that account to set aside his genus and establish a new one.

In addition to the Australian, Lord Howe, and Norfolk Island species, I have examined the anthers of *K. salicornioides* Van Tiegh., from New Zealand, and also *Korthalsella* (*Viscum*) *pendulum* A. A. Heller, and a specimen labelled

Viscum articulatum from Hawaii, all of which, to my mind, have the same staminal arrangement.

The last-mentioned plant must not be confused with the Australian plant, as it is quite different, particularly in the complanate branches.

I have not seen the male flowers of *K. Lindleyi* from New Zealand, but the female flowers and the fruits differ only in size from those of all the other species referred to.

I have given considerable attention to *Korthalsella articulata* which is very closely allied to *Pseudixus japonicus* Hayata in nearly all the essential characters, but it appears to differ somewhat widely in the internodes, and to some extent in the anthers. It must be borne in mind that the anthers are the deciding factor between *Korthalsella* and *Pseudixus*, and, owing to their minuteness, they are very difficult to define.

Of the numerous male flowers examined in all stages of development, I was unable to find one with the anthers clearly separated along what appears to be the sutural line; but numerous anthers showed a perfectly defined central pore or orifice, without the slightest sign of cleavage of the suture. On the other hand, when in a dry state, the connate anthers separate in whatever direction the needle is directed, more readily than along the sutural line. The same result was noted when the flowers were boiled. In fact, I can come to no other conclusion but that the majority of the anthers examined were dehiscent through a terminal orifice.

The camera-lucida drawing, by Miss M. Flockton, depicts a male flower artificially opened, with two-celled anthers, without the broad receptacle shown by Hayata. It is obvious that the Japanese plant has the anthers more fully developed than the Australian plant.

Sect. BIFARIA Engler.

Engl. et Prantl, Nachtr., 138.—*Bifaria* Van Tiegh., *Bull. Soc. bot. France*, xliii, 1896, 164.

Floral bracts on one plane. Flowers surrounded by minute moniliform cilia. Internodes cylindrical or compressed.

Australian Species.

- i. Internodes longer than broad, usually three-nerved, contracted at both ends. Flowers of the old branches usually encircling the internodes ... 1. *K. articulata*.
- ii. Internodes broader than long, 3- to 7-nerved, not contracted at the ends. Flowers on the shoulders of the internodes only 2. *K. australis*.

Island Species.

- i. Internodes 20-25 cm. long, with 3 scarcely prominent nerves 3. *K. Howensis*.
- ii. Internodes more than 25 cm. long, with 3-7 prominent nerves 4. *K. opuntioides*.
- iii. Internodes 1-3 cm. long? ? 5. *K. bigibba*.

The floral band of Viscum and Korthalsella.

The floral band or floral cushion of *Viscum* and *Korthalsella* is best described as a thin expansion of the upper margin of the internode which functions as a protection for the young shoots and flowers. It is considerably broader on the shoulders than in the middle, and usually forms a socket-like appendage over the shoulders of the internodes. In *Viscum* it is invariably a mere band, while in *Korthalsella* it expands into a cushion-like receptacle, closely packed with minute

moniliform, white or pink cilia, resembling a little mop, or the head of a diminutive Composite. Both the floral band and the floral cushion have much in common; they are not only the torus of the flowers, but also the growing point, for many young shoots spring from either of them, after the flowers and fruits have fallen, and more than one (perhaps several) generation of flowers originates upon them as in other shrubby plants that produce flowers on the old nodes annually.

1. KORTHALSELLA ARTICULATA (Benth.), n. comb. Plate i.

B.Fl., 1866, iii, 396; Mueller, *Report Burdek. Exped.*, 1860, 12, as *Viscum articulatum* (non Burm., non Franch., non Tate); Van Tiegh., *Bull. Soc. bot. Fr.*, xliii, 1896, 146, as *Bifaria breviararticulata*; Engl. et Prantl., *Pflzfam.*, i, 1897, 138, as *Kortalsella breviararticulata* (Van Tiegh.); Bail., *Fl. Q'land*, v, 1384; *Com. Cat. Q. Plants*, 466, fig. 452.

Mueller did not describe his species, but accepted Dr. J. Hooker's decision that it was conspecific with *V. articulatum* Burm. (*Fl. Ind.*, 311). He also expressed the opinion that "it differed in no particular from *V. moniliforme* Blume, as illustrated in the *Spicilgium Neilgherrense*, t. 87."

Bentham's description is the first on record and as it is somewhat imperfect I am obliged to describe the plant more fully:—Compact plants from 3 to 24 inches in diameter, somewhat erect when young, but soon forming dense conglomerate pendulous masses; union fusiform, branches compressed, articulate, the old ones semi-terete, especially at their junction with the host; internodes thick, cuneate oblong, coriaceous, 2 to 4 cm. long, 1 to 1½ cm. broad, 1- to 3-nerved, with flexuose wrinkles between them, usually of a yellowish-brown colour; stipules small, persistent, acute, sometimes completely concealed by the floral band or cushion which is persistent on the upper portion of the internode; at first it is bandlike, but with the development of the branch, which may extend over a number of years, it forms a pulvinate projection on the shoulders of the internodes. Flowers few or numerous within the floral cushion, surrounded by moniliform, crystalline cilia, which often change from white to pink, or in some specimens a purple-brown colour, which no doubt, is due to climatic conditions. Sometimes the flowers are nearly all males, especially on the ends of the branches, but usually the percentage of females greatly exceeds that of males.

Male flowers globose, stipitate or turbinate, about ¾ mm. in diameter, three-lobed, the lobes broadly and obtusely triangular to nearly orbicular, concave, somewhat gibbose on the back, persistent. Anthers connate, globose or depressed-globular, in the centre of the flower, marked by six very faint lines, three of which are slightly more prominent than the others and correspond to the valves of the two-celled anthers, which sometimes open very imperfectly along the suture, alternately with the petals, but apparently they are more often dehiscent by a central pore. Female flowers cylindrical or pear-shaped, longer than the males, crowned with three persistent, very short, broad, triangular, scarcely concave lobes; style very short; stigma pulvinate. Fruit pear-shaped, 2 to 3 mm. long, opening apically; epicarp thick, yellowish; seeds compressed, broadly cordate or reniform, ½ mm. long, covered with a white reticulate membrane; endosperm green; hypocotyl green, terete; disc conical; cotyledons hyaline or rudimentary (only two observed), unequal, usually acute or the longer more acute than the other, withdrawn from the endosperm when germination takes place.

K. articulata appears to be self-parasitic in the seedling stages only; numerous

seeds germinate on the parent plant in profusion, but do not thrive after attachment takes place. I have been unable to find any large examples of self or secondary parasitism on the parent plant, but a large number of seedlings are seen in various stages of development infesting the parent which do not seem to pass beyond the germinating stage.

Synonyms.—*Viscum articulatum* F.v.M. (also Benth., non Burm., non Franch, non Tate), *Bifaria breviarticulata* Van Tiegh., *B. rubra* Van Tiegh., *Korthalsella rubra* (van Tiegh.) Engl.

Range.—*South Australia*: Lake Eyre Basin (Professor Tate, Trans. Roy. Soc. S.A., 1887/88, xi, p. 94), near Ooldea Soak, on *Acacia ramulosa* (Prof. J. B. Cleland, Aug., 1922).

Western Australia: Messmate Creek, Parker's Range, on *Buchannia oblongifolia*. Plants greenish-yellow, flowers greenish. Fruit yellow, W. V. Fitzgerald, *Proc. Roy. Soc. W.A.*, iii, 1918, 34. I made application for the loan of this specimen, but was informed that the genus was not represented in the Western Australian Herbarium.

New South Wales: Mount Dromedary; Kiama, on *Doryphora sassafras*; Mt. Kembla, on *Ceratopetalum apetalum*; road to Mt. Irvine and Mt. Wilson, on *Polyosma Cunninghamii*; Blow Clear State Forest, 10 miles N. of Bogan Gate, on *Geijera parviflora*; Trundle, on "Wilga"; Weston, on *Geijera parviflora*; Wingham, on *Callistemon viminalis*; Manning River, on *Callistemon viminalis*; Harrington Inlet, on *Eugenia Smithii*; Port Macquarie, on *Eugenia Smithii*, Page River, on *Geijera parviflora*; Clarence and Richmond Rivers, Dr. Beckler, quoted by Bentham; Coonamble. Said to be killing the "Wilga", *Geijera parviflora*; Porcupine Ridge, Gunnedah, on *Geijera parviflora*; "Myall Creek, North West of the Liverpool Range, on *Capparis Mitchellii*, also on "Wilga", *Geijera parviflora*. There were dozens of trees of each genus affected" (G. Burrow); Plains near Baradine, on *Geijera parviflora*; Baan Baa, on *Geijera parviflora*; Narrabri, on *Santalum* sp.; Warialda and Goondiwindi districts, growing on several kinds of shrubs (A. D. Porter).

Queensland: Brisbane River, on *Eugenia* sp.; Moreton Bay (F. Mueller), quoted by Bentham; Enoggera (F. M. Bailey); Johnston River, on *Eugenia* sp. (Dr. T. L. Bancroft).

Affinities.—All the Australian species bear a general resemblance to one another in the mode of growth, and in the principal morphological characters. The degree of difference between them is mainly limited to the minor characters, which are, in themselves, subject to considerable variation. The internodes afford a ready means of discrimination between the various species, which at first appear to offer but little assistance to the beginner, but eventually the facies of each species can be readily detected.

Differing from *K. Howensis* in the much flatter and thinner internodes and in the ciliate young shoots, and also to some extent in the more gibbose male flowers.

Hosts.—*Santalaceae*: *Santalum* sp. *Monimiaceae*: *Doryphora sassafras* Endl. *Capparidaceae*: *Capparis Mitchellii* Lindl. *Saxifragaceae*: *Polyosma Cunninghamii* J. J. Benn. *Cunoniaceae*: *Ceratopetalum apetalum* D. Don. *Rosaceae*: *Prunus* sp. Garden peach. *Leguminosae*: *Acacia ramulosa* W. V. Fitz. *Rutaceae*: *Geijera parviflora* Lindl., orange tree. *Anacardiaceae*: *Buchannia oblongifolia*. *Myrtaceae*: *Eugenia Smithii* Poir. and var. *minor* Maiden and Betche. *Myoporaceae*: *Myoporum Mitchellii* Lindl.

2. KORTHALSELLA AUSTRALIS (Bail.), n. comb. Plate ii, A.

Bail., *Q'land Agr. Journ.*, xxvi, 1911, 199; Bail., *Com. Cat. Q'land Pl.*, 466, fig. 453, as *Viscum australe*.

The following is the original description: "Growth of plant erect, the main stem very short, sometimes only a few lines, from this arise one or more flat, mostly 3 nerved, coriaceous branches, $1\frac{1}{2}$ to $2\frac{1}{4}$ ins. long, 3-6 lines broad, bluntly lanceolate in form, bearing here and there along the margin shorter but similar shaped branchlets. The nodal cluster small, seldom showing any marks or lines to the opposite cluster, and the indentation in which the clusters of flowers is seated is often almost imperceptible, thus in this one can scarcely speak of internodes. Inflorescence much the same as *V. articulatum* Burm., Benth. Fl. iii, 396".

Supplementary notes to the description.—Internodes, 10-15 mm. long, 10-20 broad, 3- to 7-nerved, the nerves fine. Inflorescence only on the shoulders of the internodes, the floral cushion about 5 mm. long, flowers numerous, the females far more numerous than the males. Male buds turbinate, clavate, or subglobose, attenuated at the base into a compressed, sub-angular pedicel, the whole about $\frac{3}{4}$ mm. long, just exceeding the cilia; they are more often around the edge of the floral cushion than in the centre; petals 3, persistent, smooth or gibbose, connate; receptacle small; petals broadly triangular, thick, concave, the front or central petal more flexible and more lip-like than the others. Anthers synantherous, forming a globular mass over the centre of the receptacle, $\frac{1}{4}$ mm. in diameter, two-celled, dehiscent by a single central pore. Female buds elliptical, or pear-shaped, usually half imbedded in the moniliform cilia, tri-merous; petals very small, triangular, incurved, persistent on the ripe fruit. Style minute; stigma large, pulvinate. Fruits yellowish, pyriform, about 2 mm. long, $1\frac{1}{2}$ mm. in diameter; seeds smooth, cordate; embryo semi-terete; cotyledons rudimentary.

Synonym:—*Viscum australe* Bail.

Range.—Up to the present the species is known only from Queensland: Warwick, parasitic on *Heterodendron diversifolium* (F. C. Hall, vide C. T. White, Queensland Naturalist, v, ii, 1915, p. 32, as *V. australe* Bail.); Toowoomba, on *Carissa Brownii* (H. A. Longman); Crow's Nest, 70 miles W.N.W. of Brisbane, and about 20 miles N. of Toowoomba, on Mandarin Orange tree (E. W. Peechy, No. 1066, 18th May, 1896. The type); Main Range, near Gowrie, on *Croton insulares* (F. M. Bailey, cotype).

Affinities.—It appears to be more closely allied to *Viscum pendulum* Heller, from Hawaii, than to its Australian congener. The Hawaiian plant is considerably larger and has broader internodes; the floral cushions are also larger. Some forms of *K. opuntioides* have broad internodes, but they differ in being thicker and more oblong than those of *K. australe*; on the other hand, there is no difference in the female flowers, but the male buds present slight variations.

Hosts.—Rutaceae: Mandarin Orange. Euphorbiaceae: *Croton insulares* Bail. Sapindaceae: *Heterodendron diversifolium* F.v.M. Apocynaceae: *Carissa Brownii* F.v.M.

3. KORTHALSELLA HOWENSIS (Van Tiegh.) Engl. Plate ii, B.

Engler et Prantl, Nacht. i, 1897, 133; Moore, Lord Howe Is., Off. Report 24, 1870, as *Viscum opuntioides* (non Bauer, non L., non Heyne ex DC.); Muell., *Fragm.*, ix, 1875, 77, as *Viscum articulatum* (non Burm.); Muell., *ibid.*, as *V. distichum* (non Endl.); Tate, *Macleay Mem. Vol. LINN. Soc. N.S.W.*, 1893, 219, as *V. articulatum* Burm.; Hemsl., *Ann. Bot.*, x, 1896, 250, as *V. articulatum* Burm.; Van Tiegh, *Bull. Soc. bot. Fr.*, xliii, 1896, 164, as *Bifaria Howensis*; Oliv., *Trans.*

Proc. New Zeal. Inst., xlix, 1917, 115, as *K. articulatum* and *K. articulata*. I have not seen Van Tieghem's description.

Compact plants, 2-6 inches in diameter (J. L. Boorman). Branches divaricate, usually pendulous; internodes yellowish, terete, convex or compressed, coriaceous, ovate to cuneate, with one to three prominent nerves, and two to four finer nerves in large specimens, 12-30 mm. long, 5-15 mm. broad. Young shoots glabrous. Floral cushion on the shoulders of the internodes, not united in the middle, the floral band $\frac{1}{4}$ to 2 mm. deep, ciliate bracts very short and dense, usually very dark in colour on the advanced or old plants, white or pink on young plants. Flowers yellowish, single or in pairs on the young shoots, forming dense clusters on the old branches within the floral cushion, the females exceeding the males both in size and number. Male buds about $\frac{1}{2}$ mm. long, exceeding the cilia, clavate, turbinate, sometimes flat-topped, usually pedicellate, the pedicel thick or thin according to the shape of the bud, compressed or angular, petals 3, coriaceous, smooth or gibbose, usually triangular and very concave, persistent. Anthers synantherous, globose, connate in the centre of the receptacle, tardily separating into three two-celled anthers, but more constantly dehiscent by a central pore. Female flowers indistinguishable from the buds, pyriform, about $\frac{3}{4}$ mm. long, the minute persistent petals triangular, obtuse; the pulvinate stigma not exceeding them, and much darker in colour. Fruit yellowish, elliptical, or usually pyriform, about 2 mm. long; epicarp thick; seed narrow, cordate, smooth, dark green; embryo terete, obtuse, embryonic cotyledons obtuse, rudimentary. Hypocotyl in the germinating seeds very slender.

Synonyms: *Viscum opuntioides* Moore (non Bauer, non L., non Heyne ex DC.), Lord Howe Off. Rept., *Viscum articulatum* F.v.M. (non Burm.), *Fragm.*, ix, 1875, 77; *Viscum distichum* F.v.M. (non Endl.), *ibid.*; *Bifaria Howensis* Van Tiegh., *Bull. Soc. bot. France*, xliii, 1896, 164; *Korthalsella articulatum* Oliver (non Burm., non Van Tiegh.), *Trans. Proc. New Zeal. Inst.*, xlix, 1917, 115; *Korthalsella articulata* Oliv., *ibid.*, 135.

The first published record of this species is that of Moore in his Lord Howe Island Official Report, 1870, p. 24, which is as follows: "A singular plant of the Mistletoe kind. *Viscum opuntioides*, found also in Norfolk Island was observed growing in considerable quantities, but only upon two kinds of trees, *Hemicycle* and *Elaeodendron*".

Other published records and references are as follows: *Viscum articulatum* Burm. f., *V. moniliforme* Blume, *Bijdr.*, p. 667. Wight Ic. tt. 1018, 1019, *V. opuntioides* Moore, *Rept.* 2 (non L.) (vide Hemsley, *Ann. Bot.*, x, 1896, 250).

"Very abundant on the Island. Without special search, I observed it on *Elaeodendron curtispiculum*, *Cryptocarya triplinervis*, *Hemicyclia australasica*, *Coprosma putida* and *Pimelea longifolia*". (J. H. Maiden, *These Proc.*, xxxiii, 1898, 134).

R. Tate (Macleay Memorial Volume, p. 219) records it as *V. articulatum* Burm.

Northern Lookout, on *Olea paniculata*, Rev. W. W. Watts, August, 1911, in National Herbarium, Sydney.

Korthalsella articulata (Burm. f.) Van Tiegh. Parasitic on trees in lowland forest; abundant; host *Ochrosia elliptica*.

W. R. Oliver in the Vegetation of Lord Howe Island, in *Trans. Proc. New Zealand Institute*, xlix, 1917, 105 and 135.

"This parasite is not so destructive on the lives of the Tamana, *Elaeodendron curtispiculum* as it is to the Blackbutt. High up on the Scaly Bark, *Acicalyptus*

Fullagrii, a few isolated plants were noted, but nothing as prevalent as those growing on the Blackbutt. I am inclined to the belief that Tamana and Blackbutt, *Cryptocarya triplinervis* are the favoured hosts of this particular parasite" (J. L. Boorman, May, 1920; field note in National Herbarium, Sydney.)

Affinities.—Very closely allied to *K. articulata* in the internodes and female flowers and fruits, but distinguished from it in the glabrous young tips, differently shaped male buds, and also in the shape of the seeds. The moniliform cilia appear to be longer in the Australian plant. Some of the internodes of this species are not unlike those of *K. Lindleyi*, a New Zealand species.

Hosts.—Lauraceae: *Cryptocarya triplinervis* R. Br.; Euphorbiaceae: *Hemicyclia australasicus* J. Müell.; Celastraceae: *Elaeodendron curtispiculum* Endl.; Thymeleaceae: *Pimelea longifolia* Banks and Soland.; Myrtaceae: *Acicalyptus Fullagrii* F.v.M.; Oleaceae: *Olea paniculata* R. Br.; Apocynaceae: *Ochrosia elliptica* Labill.; Rubiaceae: *Coprosma putida* F.v.M.

4. KORTHALSELLA OPUNTIoidES (Bauer), n. comb. Plate iii.

F. Bauer, *Ill. Pl. Norf. Is.*, 1804-5, t. 200, as ? *Viscum opuntioides* Forst.; Endl., *Prod. Fl. Norfæ*. 1833, 61, as *V. distichum*; Walp., *Rep. Bot. Syst.*, ii, 1843, 438; Tate, *Macleay Mem. Vol.*, 1893, 218, as *V. articulatum* Burm.; Van Tiegh, *Bull. Soc. bot. Fr.*, xliii, 1896, 164, as *Bifaria disticha*, *B. bigibba*; Engler, *Engl. et Prantl., Pflz., Nachtr.*, i, 1897, 138, as *K. disticha*; Laing, *Trans. Proc. New Zeal. Inst.*, xlii, 1915, 24, as *K. articulatum* (Burm.) Van Tiegh.

As far as can be ascertained, Bauer did not describe this species, but figured it in detail under the name of *Viscum opuntioides* Forst. Apparently he had mistaken the author, as I am unable to find a reference to Forster's species. Endlicher, however, published the following description in his *Prodromus Floræ Norfolkicæ*, p. 61.

"Aphyllum distiche-ramosum, ramis compressis articulatis, articulis ovato-oblongis, longitudinaliter costato-striatis, infirmis teretiusculis, reliquis foliaceo-compressis, caulinis duplo v. triplo, ramiis quadruplo quintuplove latitudine longioribus, floribus, ad articulorum apices glomeratavertillatis, vagina brevissima truncata sustentis."

I have not seen Van Tieghem's description. The following is drawn up from specimens collected by Mr. J. H. Maiden.

Rigid divaricate plants, 6 to 12 inches in diameter; branches yellow, rather sparingly branched, the apex of the young shoots almost glabrous; internodes oblong, compressed, biconvex, those in the vicinity of the fusiform union terete, 10 to 30 mm. long, 5 to 10 mm. broad, obscurely uninerved or more often nerveless, the edges rather sharp. Inflorescence of the advanced internodes completely encircling them, the floral cushion 3-5 mm. in diameter, almost black in dried specimens (fresh specimens not seen); flowers numerous, 15 to 30 in each cushion or fewer in the young internodes, the females usually uppermost, and apparently developing first. Bracts moniliform, crystalline, pale pink to purple-brown, about half the length of the flowers. Male flowers yellow, turbinate or similar to those of *K. articulata* and *K. Howensis*. Female flowers yellow, pear-shaped, similar to the above species. Fruit pear-shaped or elliptical, $\frac{3}{4}$ mm. long; epicarp very thick; seeds broadly cordate, $\frac{1}{4}$ mm. long, $\frac{1}{4}$ mm. broad; embryo terete; embryonic cotyledons obtuse.

Synonyms.—*Viscum opuntioides* Bauer, *Illust. Pl. Norf. Is.*, t. 200 (non Heyne ex DC., non L., non Forst., non Moore); *Viscum articulatum* Tate (non F.v.M.,

non Burm.), *Macleay Mem. Vol.*, 1893, 219; *Bifaria disticha* Van Tiegh., *Bull. Soc. bot. Fr.*, xliii, 1896, 164; *Korthalsella disticha* (Endl.) Engl., Engler et Prantl, *Pflz.*, Nacht., i, 1897, 138. R. M. Laing, *Trans. Proc. New Zeal. Inst.*, xlvii, 1915, 24, records it as *Korthalsella articulatum* (Burm.) Van Tiegh.

Range.—It appears to be found over the whole of the island. Three specimens collected by J. Robinson show marked variation, viz.: (1) Internodes up to 7 cm. long and 2 cm. broad, the central nerve very prominent on one surface only, the intermediate nerves very fine (collected Sept., 1898); (2) No. 26, internodes terete to compressed-convex, 1.3 cm. long, 4 mm. broad. As this specimen is broken up, it is difficult to say whether it is a form of the preceding or a distinct species; (3) No. 227, internodes compressed, slightly convex, 2.4 cm. long, 7-17 mm. broad, the broadest five-nerved, and the narrow ones faintly three-nerved (collected 1902). Mr. J. H. Maiden, *These PROCEEDINGS*, xxviii, 1903, 715, 770 (1903) has the following note: "The joints are as much as 1½ in. across. It is very abundant on the Island, being very common on *Baloghia lucida*, the Bloodwood. The only other native tree on which I observed it is *Xanthoxylon Blackburnia*, but further search should be made. As regards introduced plants, it is common on Lemons and kills Peach trees. In fact it is a pest in orchards". Mr. Maiden's specimen is similar to No. 1.

Affinity.—*K. opuntioides* appears to be a much larger plant than either *K. Howensis* or *K. articulata*; it also differs from them in the rigidity of the branches, more venulose internodes, and in the broadly cordate seeds.

Hosts.—Rosaceae: *Persica vulgaris* L.; Rutaceae: *Xanthoxylon Blackburnia* Benth., *Citrus Limonum* L., *C. aurantium* L.; Euphorbiaceae: *Baloghia lucida* Endl.

5. KORTHALSELLA BIGIBBA (Van Tiegh.) Engler.

Engler, *Bull. Soc. bot. France*, xliii, 1896, 164, as *Bifaria bigibba*. I have not seen a description of this species, and therefore I am unable to say definitely what it is, or whether it is conspecific with *K. opuntioides*.

On Plate iii, figures 12 and 13 depict a very narrow form which may be referable to *K. bigibba*. It is the most extreme form that I have seen from Norfolk Island, and probably a distinct species. Unfortunately the material is imperfect; only female flowers are available, and they are the same as in all the other species. The internodes are almost terete, to compressed-convex, 1.3 cm. long, 4 mm. broad.

Synonym.—*Bifaria bigibba* Van Tiegh.

II. 2. VISCOIDEAE-VISCEAE.

Engler, Engl. et Prantl, *Pflzfam.*, iii, 1889, 190; Nachtr., 1897, 137. *Viscées* Van Tiegh., *Bull. Soc. bot. France*, xliii, 1896, 185.

Placenta basal. Anthers with four or numerous chambers, dehiscent by pores.

- (a) Anthers not united with the petals, opening at the top by an oblique fissure. Hoary or golden stellate shrubs *Notothixos*.
 (b) Anthers adnate to the petals, many-chambered. Green leafy or leafless shrubs. *Viscum*.

6. NOTOTHIXOS Oliv.

Journ. Linn. Soc., vii, 1864, 103; Benth., *B. Fl.*, iii, 396; Benth. et Hook, f., *Gen. Pl.*, iii, 214; Engler, Engl. et Prantl., *Pflzfam.*, iii, i, 192; Nachtr., 139; Moore et Betche, *Handbk. Fl. N.S.W.*, 227; Mueller, *Fragm.*, ii, 109; Bail., *Q'land Fl.*, v, 1382.

Flowers unisexual. Calyx border quite inconspicuous. Petals 4, rarely 3 or 5, persistent. Anthers with a very short filament, inserted between the base of the petals and the quadrangular disc, transversely bilobed, more or less reniform, obscurely chambered, dehiscent by pores. Stigma sessile, fruit a one-seeded ovate, or globose berry.

Parasitical dichotomous shrubs, more or less covered with a golden or hoary glandular puberulence, rarely at length, nearly glabrous. Leaves opposite, flat or concave, three- or five-nerved, but the nerves often obscure, usually glabrous and shining above, golden or hoary beneath. Stipules minute, rigid, acute. Flowers minute, sessile in little compressed pedunculate heads, solitary or severed on a common terminal peduncle, the cymule androgynous.

The structure of the male and female flowers is nearly the same in all the species, but the female flowers are more numerous than the males, which are difficult to detect even in the living specimens.

"Candelabra-hairs with unicellular tiers are formed in *Notothixos*, according to Engler. These hairs consist of a row of short and somewhat ventricose, thin walled cells, divided into 4 or more rays" (*vide* Solereder, ii, p. 727).

The genus, at one time, was believed to be confined to Australia; but with the advancement of the botanical survey of the world's flora, its range has been considerably extended. There are four species endemic to Australia, three to the Philippine Islands, while British New Guinea, Ceylon and Malay, have each one representative, making a total of 10 species.

The Australian species are confined to the coastal area of New South Wales and Queensland, and they are invariably parasitic on another member of the same Family.

Notothixos differs from *Viscum* mainly in the hoary or golden vestiture, and in the shortly stipitate pouched anthers, while the perianth lobes are, without exception, persistent.

Synonym.—*Tupeia*, Mueller, *Journ. Linn. Soc. Lond.*, ii, 1858, 156.

Sect. EUNOTHTIXOS Van Tiegh.

Bull. Soc. bot. France, xlii, 1896, 187, Engler, Engl. et Prantl, *Pflzfam.*, iii, i, 192; Nachtr., 139.

Inflorescence racemose or cymose, the flowers disposed on shortly pedunculate, opposite clusters along the elongated common peduncle, or in short, usually deflexed cymules of three to nine flowers. Leaves usually large, three- to five-nerved, hoary or golden pubescent underneath.

Inflorescence, racemose or cymose. Leaves quinque-nerved.

- i. Inflorescence racemose. Leaves more or less hoary or nearly glabrous, quinque-nerved, broadly oblong to lanceolate, 4-10 cm. long 1. *N. cornifolius*.
- ii. Inflorescence cymose. Leaves tri-nerved. Cymes elongated. Leaves golden pubescent, 7-13 cm. long 2. *N. leiophyllus*.
- iii. Cymes short. Leaves 2-4 cm. long 3. *N. subaureus*.
- iv. Leaves hoary var. *cinera*.

Sect. PENCIXOS Van Tiegh.

Engler, Engl. et Prantl, l.c.

Flowers in triads, the short peduncle bearing three almost sessile flowers. Hoary plants with small cuneate or spatulate leaves.

Flowers in triads.

- 1. Leaves small, hoary, cuneate 4. *N. incanus*.

1. NOTOTHIXOS CORNIFOLIUS (A. Cunn.) Oliv. Plate iv, B.

Journ. Linn. Soc., vii, 1864, 103; Benth., *B. Fl.*, iii, 397; Ettings., *Über die Blatts. der Lor.*, tab. iii, Figs. 16, 17, p. 7, as *Phoradendron xanthophyllum* A. Cunn.; Baker, *Proc. Linn. Soc. N.S.W.*, [2] ix, 1894, Plate xi, Fig. iv, p. 158; Bail., *Fl. Q'land.*, 1333; Engler, *Engl. et Prantl., Pflzfam.*, iii, i, 192; Nachtr., 139; Moore and Betche, *Fl. N.S.W.*, 227.

The following is the original description:—"Paniculis terminalibus, floribus in capitulis 5-9 floris patentim pedunculatis bibracteolatis digitatim dispositis, foliis obovato lanceolatis v. obovatis v. lanceolatis, obtusis deinde emarginatis retusive glabris glabrescentibusve. *Viscum cornifolium* et *V. xanthophyllum* A. Cunn. M.S. Hab.: Hunter River and Liverpool Plains".

The following is a more detailed description:—Robust shrubs; union ball-like; the young plants hoary and sometimes golden tomentose, the adult foliage almost glabrous; branches terete, pendulous; internodes 2-10 cm. long; leaves obovate oblong to oblong-cuneate or oblique, obtuse, sometimes thick and almost elliptical, narrowed into a short petiole, three- to five-nerved, mostly 1½ to 4 inches long; stipules scarcely conspicuous, but always present on the young branches, acute, concave, villose inside. Flower heads several, opposite, in pairs in a terminal or axillary raceme, sometimes exceeding the leaves, with minute bracts under the short pedicels and under the heads. Flowers sessile in the heads, the female 4-5 mm. long, the males 2-3 mm. long, one or two in the female cymule, but sometimes forming independent cymules in the upper portion of the raceme. Anthers uniform, stipitate, smaller than in *N. incanus* and somewhat broader. Female flowers cylindrical, urceolate, the petals triangular acute; style broad, expanded into a two-lobed stigma. Fruit urceolate, 7-8 mm. long, slightly scurfy; seeds flat, enclosed in a strongly reticulate membranous sac surrounded by copious viscin which hardens and gives the seed a winged appearance. Hypocotyl slender, terete. Endosperm green.

This species is sharply separated from all the others by the racemose inflorescence and the large quinquenerved leaves.

Synonyms.—*Viscum xanthophyllum* A. Cunn., *Viscum incanum* Hook. var. *racemosum* Mueller (in herb.), *Phoradendron xanthophyllum* A. Cunn.

Range.—*New South Wales*: Burrinjuck, on *Brachychiton populneus*; Port Jackson (J. D. Hooker), quoted by Oliver, l.c.; Rylstone; Goulburn River; Taloobie, near Bylong Creek, on *Sterculia diversifolia*; Upper Hunter (A. Cunningham), quoted by Oliver, l.c.—this is a type locality; Warrah, on *Brachychiton populneus*, leaves broadly lanceolate-acuminate; Liverpool Plains (A. Cunningham), quoted by Oliver, l.c., a type locality; Coramba—flowering branch 2½ ins. long; Clarence River (this specimen is labelled *Viscum incanum* Hook. var. *racemosum* F. Mueller in Mueller's handwriting, it is typical *N. cornifolius*); Lismore (the leaves are more acute than in any other specimen, otherwise the same); Richmond River. *Queensland*: Brisbane River and Moreton Bay (A. Cunningham, and Fraser), quoted by Bentham, l.c.; Kelvin Grove; Three Mile Scrub; Buderim Mountain, on *Casuarina* trees, common; Enoggera.

Hosts.—*Casuarineae*: *Casuarina* sp.; *Sterculiaceae*: *Brachychiton populneus* R. Br.

Var. ANGUSTIFOLIA Oliv.

Journ. Linn. Soc., vii, 1864, 103, without a description.

The localities quoted are Brisbane River (Cunningham, Fraser); Moreton Bay (Cunningham).

Bentham apparently overlooked this variety in the flora as there is no reference to it by him.

So far, I have not seen any specimens which are suggestive of the variety from Queensland or New South Wales, and I have examined all the material in the Queensland Herbarium.

2. NOTOTHIXOS LEIOPHYLLUS K. Sch. Plate v.

Nacht. Fl. Deut. Schut., 1905, 260. Assimilis *N. cornifoliae* Oliv. et *N. subaurei* Oliv. at foliis jam majoribus ad 8 cm. longis et 4-5 cm. latis conspicue trinervis utrinque glabris innovationibus pulchre aureis diversus. Bismarck-Archipel. New Pommern (R. Parkinson).

Golden pubescent shrubs similar to *N. subaureus*. Leaves broadly lanceolate, acuminate, 4-12 cm. long, 3-6 cm. broad. Inflorescence racemose, bracteate; the keeled bracts supporting one or two cymules, the lower cymule of each pair, and sometimes the terminal ones of the raceme males. Female flowers more numerous than the males, cylindrical; style very short. Male flowers globose, about half the size of the females and somewhat similar to those of *N. subaureus*.

Affinity.—This species is closely allied to *N. subaureus* and at a casual glance would pass for a large-leaved form of that species, but apart from the leaves being larger they are more acuminate, and the inflorescence is more racemose than cymose, but the flowers and fruits are similar to those of *N. subaureus*.

Range.—Besides the specimen already quoted I have seen specimens from the following districts:—

Papua: Base of Owen Stanley Range (H. C. Forbes, recorded by Mueller in Descriptive notes on Papuan plants, 1885, p. 61, as *N. subaureus*). Leaves broadly elliptical to acuminate, 4-12 cm. broad.

Queensland: Rockingham Bay (Dallachy, in Melbourne Herbarium); Johnston River (H. G. Ladbrook, in Queensland Herbarium); also the following: Trinity Bay (F. M. Bailey). This and Dallachy's specimen are very near the type which came from New Pommern, Bismarck Archipelago.

Synonym: *Notothixos subaureus* F.v.M., non Oliver.

3. NOTOTHIXOS SUBAUREUS Oliv. Plate vi.

Journ. Linn. Soc., vii, 1864, 103; Benth., *B. Fl.*, iii, 397; Mueller, *Key Vic. Pl.*, i, 273; Baker, *Proc. Linn. Soc. N.S.W.*, [2], ix, 1894, 158, Pl. xi, Fig. iii; Bail., *Fl. Queensland*, v, 1383; Engler et Prantl, *Pflzfam.*, iii, i, 192, et *Nachtr.* 139; Moore et Betche, *Fl. N.S.W.*, 227.

The following is Oliver's description:—"Floribus in capitulis terminalibus 5-9 floris, pedunculatis debracteolatis radiatum dispositis, pedunculis simplicibus geminatisve aut ternatimramosis, foliis elliptico ovalibus vel ovato-lanceolatis obtusis v. subacutis subtus pilis aureis stellatis pubescentibus (*Viscum subaureum*, F. Mueller)".

Supplementary description.—Small compact shrubs, usually parasitic on another member of the Family, rarely on other Families. Union globose, without adventitious roots, often forming dense masses from 6 inches to 3 feet in diameter. Leaves densely covered on the under surface with a golden stellate tomentum, the upper surface a dark glossy green, usually ovate or elliptical, sometimes shortly acuminate, narrowed into a distinct petiole, mostly 2-4 cm. long, triplinerved, the transverse veins somewhat prominent. Stipules very



small, acuminate, the first pair opposite, at the apex of the internode, more or less deciduous, the second pair 3-7 mm. above the node, usually alternate and persistent. Inflorescence cymose, densely tomentose, the common peduncle usually with three reflexed cymules, or sometimes consisting of a single cymule, secondary peduncles very short, the apex above the concave navicular bracts expanded into a flabelliform receptacle, on which the minute flowers are arranged in a single row around the edge, each in a separate depression of the flabelliform receptacle, all male or all female, or a large percentage of the cymules with both sexes, but the females usually predominant. Male flowers globose, sessile, the broad persistent petals longer than the basal portion. Anthers with very short filaments, inserted between the subquadrangular, depressed disc and the base of the petals reniform or pouched, opening by an oblique fissure, five- to nine-chambered, dehiscent by pores, the cells covered with a thin transparent membrane. Female flowers tetramerous, cylindrical, very shortly pedicellate, 2-3 mm. long; petals narrow, small, persistent; style very short. Fruits globose, 4-5 mm. in diameter, crowned by the petals, pale green or whitish, minutely tomentose. Seeds flat, hoary, 2-3 mm. long. Hypocotyl terete, green, exceeding the length of the seed; suctoral disc conical, sometimes acute, during the growing period before attachment with the host. Embryonic cotyledons minute, with a very small apicula, about $\frac{1}{2}$ mm. long. Primary leaves elliptical, similar to the adult leaves, and like them golden pubescent.

Synonyms.—*Viscum subaureum* F.v.M., *Viscum aureum* Woolls, *Viscum incanum* Hook., var. *subaureum* F.v.M.

Range.—New South Wales: It is very common from North Sydney to the Hawkesbury River, near Brooklyn, and is invariably parasitic upon both *Phrygilanthus* and the local species of *Loranthus*; Blaxland, on *Phrygilanthus eucalyptifolius*; additional northern localities are Gosford; Tuggerah Lakes, on *Loranthus Cambagei*; Belmont on *L. Exocarpi*; Manning River; Hastings River; Nundle; Tamworth, on *L. Miquelii* and *L. miraculosus*, var. *Boormani*; Ash Island; Ramornie, near Copmanhurst, on *L. alyxifolius*, *L. pendulus*, and *Viscum angulatum*; Lismore; Ballina; Tintenbar, on *Acacia* sp.; Richmond River; Tweed Heads, on *Tristania suaveolens*; Acacia Creek.

Queensland: It is very common around Brisbane and extends northwards as far as Kin Kin. At Toowong it was found growing on *Grevillea robusta*.

Affinities: Closely allied to *N. leiophyllus* K. Sch., and differing mainly in the smaller leaves, and shorter cyme. *N. subaureus* is also closely allied to *N. Malayanus* Oliv., but the fruits of the latter are cylindrical, not globose according to the figure in Hooker's *Icones*, third series, vi, t. 1519.

Hosts.—Loranthaceae: *Phrygilanthus celastroides* (Sieb.) Eichl., *P. eucalyptifolius* (Sieb.) Engl., *Loranthus congener* Sieber, *L. alyxifolius* F.v.M., *L. pendulus*, Sieber, *L. Miquelii* Lehm., *L. Cambagei* Blakely, *L. vitellinus* F.v.M., *L. Exocarpi* Benth., *Viscum angulatum* (Heyne) D.C.; Proteaceae: *Grevillea robusta* R. Br.; Leguminosae; *Acacia* sp.; Myrtaceae: *Tristania suaveolens* R. Br.

Var. CINERA, n. var.

Folia cinero-tomentose, haud aureis ut in *N. subaurei*.

Leaves and inflorescence the same as in *N. subaureus* but the vestiture is hoary instead of golden, and it is also minutely woolly, not stellate as in the species.

Range.—Kuranda, North Queensland (Rev. N. Michael). Mr. R. T. Baker, These PROCEEDINGS, 1894, 158, Plate xi, fig. iii, refers to a variety with silvery leaves. He says: "From the same locality (Lismore) as the previous variety (ii), [*N. subaureus*] but has larger leaves than i and ii, and there is a distinct departure from the golden tomentum to a silver sheen. It is also distinctly triplinerved, the transverse veins are distinctly prominent, and the leaf is also of a much thinner texture than forms i and ii. Sufficient specimens have been examined to show that it is no sport."

I have not seen Mr. Baker's specimen, and there is no outstanding character in the plant depicted by him to differentiate it from the normal *N. subaureus*. The chief distinction lies in the colour of the vestiture, nevertheless it may be the same as var. *cinera*.

4. NOTOTHIXOS INCANUS Oliv. Plate iv, A.

Journ. Linn. Soc., vii, 1864, 103; Hook., *Ic. Pl.*, i, t. 73, as *Viscum incanum* Hook.; Benth., *B. Fl.*, iii, 397; Mueller, *Fragm.*, ii, 109; Baker, Proc. LINN. Soc. N.S.W., [2], ix, 1894, 158, Plate xi, fig. 1; Bail., *Fl. Q'land.*, v, 1332; Engler, Engl. et Prantl., *Pflanzfam.*, iii, i, 192, et Nachtr., 139; Moore et Betche, *Handb. Fl. N.S.W.*, 227.

The following is the original description:—"Incano-sericeum, caule ramosissimo, ramis oppositis, foliis spathulatis subcarnos, pedunculis brevi terminali bifloro, floribus foemineis cylindraceutis, peranthi limbo 4 lobo."

Densely branched shrubs; union clavate; branches hoary with a minute tomentum, occasionally much compressed below the leaves, the older branches terete, 1-3 feet long; leaves oblong-cuneate or spathulate, narrow into a short petiole, very obtuse, mucronulate, $\frac{1}{2}$ -1 inch long, rarely longer, the nerves faint; stipules acute, inconspicuous. Flower heads solitary or sometimes three together, bracteate, on very short terminal quadrangular peduncles, usually with three flowers, the males clavate, about half the size of the females.

When the flowers are ternate the male occupies the central position, and is the first to develop, almost reaching its full size before the two females make their appearance; when fertilization takes place it drops off, leaving the two females, which then convey the impression that the female flowers originate in pairs only. Anthers similar to the other species. Female flowers clavate, fusiform, the petals triangular, concave, persistent. Style conical, stigma obtuse.

Fruit pubescent or scurfy-tomentose, shaded pink, contracted or somewhat stipitate, cylindro-elliptical, crowned with the persistent acute petals, 11 mm. long. Viscin copious; seeds flat, covered with hoary pubescent scales, 5 mm. long, 3 mm. broad. Embryo green, embedded in the dark green endosperm, awl-shaped, embryonic cotyledons acicular. Hypocotyl green, terete, with a few scattered papillae along it, suctorial disc conical, not enlarged. Fruit and seed quite different from those of *N. subaureus*; seeds compressed, 3-4 mm. long, enclosed in a reticulate membrane; hypocotyl terete, the disc scarcely enlarged.

Range.—This species, like all the others, belongs chiefly to the east coast of the continent, and so far has not been found further south than Mt. Kembla, in New South Wales. The following is the extent of its range as at present known:—

Victoria: It is included in Professor A. J. Ewart's Recording Census of the Victorian Flora, 1908, p. 42. I have not seen a Victorian specimen.

New South Wales: Mt. Kembla, on (*Loranthus*) *Phrygilanthus celastroides*, A. G. Hamilton, These PROCEEDINGS, xxxi, 1905, 491; Mudgee, on *Brachychiton* sp.

(always in flower), A. G. Hamilton, *ibid.*, [2], ii, 1887, 282; Port Macquarie, J. H. Maiden; Kendall, on *Melaleuca styphelioides* (Dr. J. B. Cleland); Casino (E. Betche), on *Melaleuca genistifolia* (L. G. Irby); Ballina (R. T. Baker).

Queensland: Brisbane River (F. Mueller), 1855, in Melbourne Herbarium; R. Fraser (the type) quoted by Bentham, l.c., F. M. Bailey and the Rev. J. E. Tenison-Woods, *vide* These PROCEEDINGS, iv, 1879-80, 160; Bulimba, on *Melaleuca genistifolia* (C. T. White and Francis); Burpengary (Dr. T. L. Bancroft); Warrego River (F. M. Bailey); Rockhampton, on *Croton pheballoides* (J. L. Boorman).

Affinity.—This species is markedly distinct from its congeners in nearly all essential characters, its nearest affinity appears to be *N. subaureus* Oliv. var. *cinera*, from which it is distinguished by the different vestiture, spatulate leaves, and large urceolate fruits.

Hosts.—Loranthaceae: *Phrygilanthus celastroides* (Sieb.) Eichl.; Euphorbiaceae: *Croton pheballoides* F.v.M.; Sterculiaceae: *Brachychiton* sp.; Myrtaceae: *Melaleuca styphelioides* Cav., *M. genistifolia* Sm., *Angophora* sp., *Eucalyptus* sp.

7. VISCUM Tourn.

Ex *L. Gen.* ed. i, 1737, 284; Linn., *Spec. Pl.*, ed. i, 1753, 1023; Endl. *Gen.*, n. 4584; Benth., *B. Fl.*, iii, 195; Benth. et Hook. f., *Gen. Pl.*, iii, 213; Engler, Engl. et Prantl, *Pflzfam.*, iii, i, 193, et Nachtr. 139; Bail., *Fl. Q'land*, v, 1381.

Flowers monoecious in the Australian species. Calyx border rudimentary or absent. Corolla in the male flowers somewhat gamopetalous, bi-tri- or tetramerous; petals ovate, cordate or triangular, thick. Anthers forming a somewhat raised mass on the centre of the petals, or sometimes towards the base, without a well-defined division between the numerous pollen-bearing chambers, which are dehiscent by pores. Female flowers of three to four equal deciduous or persistent petals, usually similar to the males. Ovary inferior; style very short, with an enlarged, pulvinate, minutely rugose stigma, which is sometimes enclosed in the fruit, or forming a minute apicula upon it. Fruit ovoid or globose, white, red, or yellowish. Seeds enclosed in a thin white reticulate viscin sac, which breaks down when the seed is ejected from the thin, coriaceous epicarp, and acts as an adhesive for the seed, which is usually compressed, ovate or cordate. Endosperm green; embryos one-three, terete; the suctoral disc rather large for the slender hypocotyl. Embryonic cotyledons hyaline or rudimentary, invariably unequal, and usually withdrawn on germination. Hypocotyl terete, entire (or not cleft).

Leafy or leafless shrubs often parasitic on another member of the same Family. Union ball-like, or clavate without adventitious roots. Branches terete, compressed, or angular, more or less swollen at the nodes; the internodes sometimes striate. Leaves when present simple, opposite and usually well developed, when absent represented by minute stipular-like scales. Flowers axillary or terminal, solitary or fascicled, very small, green or yellowish, often two or three seated within minute cupular, or variously shaped bracts. Fruit baccate, green or yellowish, smooth or verrucose.

There are about 70 species known, mainly indigenous to the warmer parts of the globe. Of the three Australian representatives of the genus, two belong to the aphyllous group.

Sect. PLOIONIXIA (PLOIONUXIA) Korth.

Verh. Batav. Gen., xvii, 1839, 254; Engler, Engl. et Prantl, *Pflzfam.*, Nachtr., 140.

Leaves well developed. Flowers in triads or clustered at the apex of the common peduncle, the central flower of each triad usually staminate.

Leaves well developed 1. *V. Whitei*.

Sect. ASPIDIXIA (ASPIDUXIA) Korth.

Verh. Batav. Gen., xvii, 1839, 258; *Aspidixia* Van Tiegh., *Bull. Soc. bot. France*, xliii, 1896, 191; *Dipleura* Van Tiegh., *ibid.*, 192; Engler, *Engl. et Prantl, Pflzfam.*, Nachtr., 140.

Leaves reduced to microscopic scales. Flowers single or in clusters. Inflorescence androgynous.

Leaves scale-like.

- i. Flowers in cymes of three or four flowers. Male buds broadly cordate. Fruit stipitate 2. *V. Bancrofti*.
- ii. Flowers solitary or in clusters, usually within a cradle-like bract. Male buds more or less globose. Fruit sessile within the persistent bract 3. *V. angulatum*.

1. VISCUM WHITEI, n. sp. Plate vii.

V. orientale Benth. non Willd., *B. Fl.*, iii, 1866, 396; Bail., *Q'land Fl.*, v, 1382, as *V. orientale* Willd.; *Comp. Cat. Q'land Pl.*, Fig. 450.

Frutex glaber foliaceus densas pendulus congeries, 1-2 pedes longas proebens; rami tenues; internodia compressa angularia et aliquanto sulata, paulisper ad apicem latiora, 2-4 cm. longa, 2-6 mm. lata. Stipulae lineares acutae 0.5 mm. longae, deciduae. Folia opposita erecta saepe inaequaliter longa angustalanceolata, 2-4 cm. longa, 3-8 mm. lata, mucronulata obscure trinervata, in parvum recurvatum petiolum angustata. Flores monoecii cymos sessiles 3-4 florum proebentes, pedunculos subtriangulares bracteatos terminates. Gemmae staminatorum compressae lati cuneatae vel cordatae, dimerae, petalis valvatis persistentibus; antheris triangularibus pluribus poris dehiscentibus. Gemmae pistillatorum cylindraceae 2-3 merae, 2 mm. longae; petalis valvatis, triangularibus, deciduis. Fructus globosus, stipitatus 3 mm. diam., seminibus compressus.

Glabrous leafy shrubs forming dense pendulous masses, 1-2 feet long, branches slender, internodes compressed, angular or sulcate, slightly enlarged at the apex, 2-4 cm. long, 2-6 mm. broad, stipules linear, acute, $\frac{1}{2}$ mm. long, soon deciduous. Leaves opposite, erect, often unequal in length, narrow lanceolate, 2-4 cm. long, 3-8 mm. broad, contracted at the top into a very small oblique mucro, obscurely tri-nerved, tapering at the base into a small curved petiole. Flowers monoecious, forming sessile clusters of three or four, terminating compressed or subtriangular, bracteate peduncles, the clusters sometimes all females, but usually only the central flowers male, and the lateral ones female. Bracts persistent, linear, navicular, acute, 2-3 mm. long. Male buds compressed, broad cuneate, cordate or obtuse, bi-merous; petals valvate, concave, persistent on the receptacle; anthers triangular, five- to seven-celled. Female flowers cylindrical, acute, bi- or tri-merous, 2 mm. long; petals valvate, triangular, soon deciduous; style small; stigma scarcely enlarged (the flowers are similar to those of *V. Bancrofti* in every detail). Fruit shortly stipitate, globose, striate, 3 mm. in diameter, the persistent stigma apiculate; seeds compressed.

Range.—Berserker Range, Rockhampton, Queensland, in Melbourne Herbarium, labelled *Viscum orientale* Willd. (This is probably the specimen quoted by Bentham thus: "Rockhampton, Bowman: a single small specimen in (Herb.) F. Mueller".); Stannary Hills (Dr. T. L. Bancroft, 1909, the type). It is also recorded in *Queensland Naturalist*, i, 1911, p. 207, as *V. orientale* Willd.

Affinity.—It is allied to *V. Bancrofti* in general characters, except that it is leafy and the fruits are striate or banded. Its affinity with *V. orientale* Willd., lies chiefly in its leafy character, and in the smooth fruits, while there is an uncertainty about the male flowers being the same, as I have not seen a description of the male flowers of *V. orientale* Willd.

Named in honour of C. T. White, Government Botanist, Queensland.

2. VISCUM BANCROFTI, n. sp. Plate viii.

Frutex parasiticus sine foliis, complenus elevatus; rami penduli longi tenues angustri orl adultiores terete; internodis 3.5 cm. longis, 1.4 mm. latis; stipulae triangulares 0.5 mm. longae.

Flores monoecii, di- orl tri-meri; bracteis carentes, plerumque triades in apice pedunculi, 3-7 mm. longi; internodiis similis, orl forsitan cymulum 5 florum probentes; gemmae florum staminatorum deimerae, 2.5 mm. longae, congeries, cordatae; petalis cordatae concavae; staminalis aliquanto magno, triangularis, pluri poris dehiscens. Gemmae florum, cylindricae 2-3 mm. longae; petali triangularis, concavi, acuti, 0.5 mm. longi, decidui. Fructus globosus translucens, stipitatus 3-4 mm. diam.

Leafless parasitic shrubs; union clavate; branches pendulous long and slender, usually very numerous, angular or the old ones terete, 1-2 feet long or more; internodes 3.5 cm. long, 1.4 mm. broad, compressed, angular or terete, and often finely striate, expanded at the top into a dilated acute stipular-like socket, stipules triangular, acute, $\frac{1}{2}$ mm. long. Flowers monoecious, di- or trimerous with small floral bracts, usually in triads on the apex of a common peduncle, 3-7 mm. long, similar to the internodes, or sometimes five flowers in a cymule, or a few solitary ones scattered along the branches, particularly on the nodes of the old branches, and also at the base of the cymule. Male buds dimerous, $2\frac{1}{2}$ mm. long, usually developing before the females, compressed, cordate, with a cuneate base, which is raised on a minute common peduncle, the basal portion or receptacle sometimes thickened on one side into a lobe-like projection, while on the other side it is truncate, and usually shorter than the persistent petals, which are cordate, concave and rather thick with very thin edges, 1.3 mm. long and about as broad. Staminal mass comparatively large, triangular dehiscent by seven to ten or more pores. Female buds di- or trimerous, usually the former, cylindrical, acute, 2-3 mm. long; petals triangular, concave, acute $\frac{1}{2}$ mm. long, very early deciduous. Style thick, $\frac{1}{2}$ mm. long, stigma domed. Fruit globose, yellowish, semi-transparent, apiculate, with the persistent and slightly enlarged style, shortly stipitate, 3-4 mm. in diameter; epicarp thin; viscin copious and very elastic; seed compressed, roundish or somewhat obcordate, $2\frac{1}{2}$ mm. long, endosperm green, hypocotyl terete, very slender, sometimes exceeding 7 mm. before attachment takes place; suctoral disc rather large, microscopically papillose; embryo cotyledons acicular, very thin, $\frac{1}{4}$ mm. long.

Range.—Eidsvold, Queensland, parasitic on *Loranthus Quandang*, var. *Bancrofti*, the Loranth parasitic on *Acacia harpophylla*. Dr. T. L. Bancroft, No. 11, 1918. The type. Dr. Bancroft writes: "This Viscum roots on the *Loranthus*, never on the 'Brigalow' *Acacia harpophylla*. It is killed by frosts, whereas the Loranth is not affected. It is always in flower and fruit. This Viscum appears to have been dioecious at one time, but now the male flowers are not produced, or only rarely. The fruit is not produced parthenogenetically".

Named in honour of the distinguished collector Dr. T. L. Bancroft, who has rendered valuable service to botany in the discovery of many new plants.

Affinities.—It is closely allied to *V. Whitei*, from which it differs in being leafless, even very young plants failing to show the slightest trace of leaves. It is allied to *V. angulatum* in the virgate branches only; all the other characters are totally different. It does not appear to have any close affinities among other leafless species.

3. *VISCUM ANGULATUM* (Heyne, Herb.) ex DC. Plate ix.

DC. Prod., iv, 1830, 283; G. Don., *Gen. Hist.*, iii, 407; Wight et Arn., *Prod.*, iii, 396; Daly and Gibs., *Bomb. Fl.*, 110; Miq., *Fl. Brit. Bat.*, i, pt. i, 806; F.v.M., *Rept. Burd. Exped.*; Hook., *Fl. Brit. Ind.*, v, 226; Moore and Betche, *Fl. N.S.W.*, 227; Bail., *Fl. Q'land*, v, 1384; Bail., *Comp. Cat. Q'land Pl.*, Fig. 451, p. 466.

The following is the original description:—

“Aphyllum, ramis, angulatus 4 gonis articulatus, floribus . . . in India orientali legit c.l. Heyne. Species exspecim imperf. distinctissima, sed vix nota. . . ”.

It will be seen that the species was named on very imperfect material, as the flowers and fruits were unknown. Having no definite characters to work out the Australian material, I critically examined and compared the Australian plant with the following specimens, from which it differs unessentially.

1. *Viscum angulatum* Heyne, on *Loranthus* sp., Botanic Gardens, Singapore, C. F. Baker, Oct., 1917, Ex. Herb. C. F. Baker, determined by E. D. Merrill.

2. There is also another specimen from the same locality, labelled *V. articulatum* Brown, 1899, without collector's name, etc. It was received from the same source some years previously and is identical with the above.

3. *V. angulatum* Heyne. (*V. capense* Blume non L. F.); Merrill's species, Blancoanal, No. 695, determined by E. D. Merrill. This specimen appears not to differ from the rest of the Australian specimens except in the shortness of the internodes, which are uniformly short throughout, and shorter than the Australian specimens.

The following description of the Australian plant is drawn up from L. G. Irby's No. 959, from Casino.

Leafless parasitic shrubs forming pendulous masses 1-3 feet long, 1-2 feet in diameter; union fusiform; branches angular or the older one terete; internodes 2-7 cm. long, 2-5 mm. broad, at first compressed, eventually becoming tri- or quadrangular, the expanded floral receptacle scarcely acute, and only slightly exerted. Flowers minute, solitary or in pairs on the young branches, whorled or in small clusters or three or four on the older ones. Bracts when the flowers are solitary two, the lower one triangular, ciliate, the upper or floral one, cradle-shaped, ciliate, $\frac{1}{2}$ mm. deep, longer than broad, enlarging somewhat under the fruit. Male buds globose, conical or subcylindrical, obtuse or acute, $1\frac{1}{4}$ mm. long, usually sessile at the base of the females or sometimes geminate in the cradle-like bract, tri- or tetramerous; petals persistent on the fertile flowers, deciduous on the barren ones; when trimerous cordate, 1 mm. long and nearly as broad; when tetramerous triangular, but usually only two of the broadest petals staminate. Anthers forming a convex mass on the inner surface of the petal, dehiscent by five to eight pores. Female buds cylindrical $1\frac{1}{2}$ - $1\frac{3}{4}$ mm. long, single or geminate within a cradle-like, ciliate bract, tri- or tetramerous, but usually the former; petals triangular, about $\frac{1}{2}$ mm. long, deciduous, paler than the ovary; stigma very

small, obtuse. Fruit globose, yellowish, but not seen in a fresh state (according to Mueller, purplish-white, the size of a small pea), 3-4 mm. in diameter, crowned with the small persistent stigma, and articulate below the bract, so that in most cases the ripe fruit falls with the bract attached to it, but at the same time it is separable from the bract, and a small rudimentary pedicel or stipes is then observed. Seeds cordate or obtusely triangular, about 1 mm. long, and as broad, covered with a white reticulate membrane which acts as an adhesive; endosperm green; embryo terete, curved; cotyledons acute; hypocotyl slender, attenuated to 3-5 mm. on germination; disc rather large and minutely papillose under the lens. It is not known whether the cotyledons are withdrawn or remain in the endosperm after germination.

Synonyms.—*Viscum psiloides* A. Cunn. (Herb.), No. 101, 1828; *V. capense* Blume (non L.F., according to E. D. Merrill).

Range.—This species appears to confine itself to the coast, and like all other members of the family its progress seems to be in a southerly direction, as it is far more plentiful in the northern parts of the continent than in the south. Its most southern limit is Ramornie, near Copmanhurst, N.S.W.

South Australia: R. Schornberg, Flora of South Australia, p. 43, records it for South Australia. I have not seen a specimen from that State. His reference probably refers to the Northern Territory, which at one time formed part of South Australia.

New South Wales: Ballina; Casino on *Casuarina torulosa*; Ramornie, on *Loranthus vitellinus* and *Notothixos subaureus* (W.F.B. and D.W.C.S.).

Queensland: Bremer River, Moreton Bay, A. Cunningham, No. 101, July, 1828 (*V. psiloides* A. Cunn.) in Queensland Herb.; Brisbane River, on Native Cherry, *Exocarpus* sp.; Ithaca Creek, on *Loranthus vitellinus*; Maryborough District, on *Loranthus* sp.; Mount Perry, J. Keys, *Proc. Roy. Soc. Q'land*, ii, 1895, 49; Port Denison, W. Hill. Quoted by Bentham; Edgecomb Bay, Dallachy, quoted by Bentham; Townsville, on *Loranthus vitellinus*; Cardwell, Rockingham Bay, "Found growing and suspended from a *Loranthus*, also alive on a wattle tree, *Acacia* sp., in the forest and not in the real shrub". S. W. Jackson; Dunk Island, on lemon tree; Herberton; Stannary Hills; Gilbert River, F. Mueller, quoted by Bentham; sources of the South Coen River; Gulf of Carpentaria; F. Mueller, *Append. Land. Exped. Aust.*, 116; vide also *Roy. Soc. S.A.*, 1895; Ewart and Davies, *Fl. N.T.*, 89; Prince of Wales Island. It is also common in Papua.

Affinity.—Amongst the Australian species it is nearest to *V. Bancrofti* in general appearance, but it is totally different in the male flowers and mode of flowering.

Hosts.—Casuarinaceae: *Casuarina torulosa* Ait.; Loranthaceae: *Loranthus vitellinus* F.v.M., *Notothixos subaureus* Oliv.; Rutaceae: Lisbon lemon; Santalaceae: *Exocarpus* sp.; Leguminosae: *Acacia* sp.

EXPLANATION OF PLATES I-IX.

Plate i.

Korthalsella articulata (Benth.) Blakely.

1. Plant, four-fifths natural size; *a*, showing union with the host.—2. A minute young tip greatly enlarged to show the ciliate border on the immature internodes.—
3. Two internodes enlarged; *a*, showing male and female buds, and fruits; *b*, showing the floral cushion.—
4. Types of young male buds.—
5. A male flower greatly enlarged.—
6. A male flower with the front petal bent down to show the connate anthers, also the moniliform cilia.—
7. Camera lucida drawing by Miss M. Flockton of a male flower, showing the anthers artificially opened.—
8. Male flower of *Pseudixos japonica* Hayata

(after Hayata).—9. A female flower with the moniliform cilia at base.—10. Top of female flower showing the stigma.—11. Fruit.—12. Germinating seed, four-fifths natural size.—13. Embryo.—14. Germinating seed with the membranous viscin sac raised around it, and the pointed hypocotyl.—15. Germinating seed separated from the host after attachment took place, to show the broad disc.—16. A young plant taken from the host, having lost the endosperm.—17. A young plant, four-fifths natural size.—18. A plant, four-fifths natural size, with rather large floral cushions and numerous flowers

All variously enlarged, except where indicated.

Plate ii.

A. Korthalsella australis (Bail.) Blakely.

1. A plant, four-fifths natural size.—2. Male bud.—3. Male flower opened out to show the connate anthers.—4. Male flower with the petals removed.—5. Female flower surrounded by moniliform cilia.—6. Fruit.—7. Longitudinal section of seed showing the germinating embryo.

B. Korthalsella Howensis (Van Tiegh.) Engler.

8. Plant, four-fifths natural size.—9. A very young turbinate male flower.—10. A clavate male bud with a tuft of cilia at base.—11. Front view of a male flower.—12. Back view of a male flower.—13. Fruit.—14. Germinating seed.—15. Embryo.

All enlarged, except where indicated.

Plate iii.

Korthalsella opuntioides (Bauer) Blakely.

1. Basal portion of a plant, four-fifths natural size.—2. Terminal portion of one of the branches of Fig. 1.—3. Male bud.—4. Female flower.—5. Fruit.—6. Seed.—7. Longitudinal section of an internode.—8. Cross section of Fig. 7.—9. Portion of a young plant showing the union and variation in the internodes.—10, 11. A large internode, four-fifths natural size, showing both surfaces.—12, 13. A form with very narrow internodes, four-fifths natural size, probably referable to *K. bigibba* (Van Tiegh.) Engler.

All greatly enlarged, except where indicated.

Plate iv.

A. Notothixos incanus Oliv.

1. Flowering branch, four-fifths natural size.—2. Cymule of very young buds.—3. An advanced cymule, showing the two female buds and the male bud in the centre.—4. Female flower.—5. Seed, four-fifths natural size.—6. Seed enclosed in the reticulate sac.—7. A germinating seed.—8. Female flower, one of the segments of the calycine limb being removed.—9. Fruit (scarcely mature).—10. Vertical section of fruit (8, 9, 10 after Hooker).

B. Notothixos cornifolius Oliv.

11. Flowering and fruiting branch, four-fifths natural size.—12. Terminal portion of a flowering branch, four-fifths natural size.—13. An acuminate leaf, four-fifths natural size.—14. A cymule of male flowers.—15. Female flower.—16. Male flower opened out to show the anthers (after Baker).—17. Ground plan of female flower (after Baker).—18. Back view of anther.—19. Front view of anther.—20. Seed, four-fifths natural size.—21. Seed without the membranous sac.—22. Seed with the membranous sac.

All greatly enlarged, except where indicated.

Plate v.

Notothixos leiophyllus K. Sch.

1. A branch showing the inflorescence, four-fifths natural size.—2. A leaf, four-fifths natural size.—3. Portion of a branch, to show the acuminate bracts.—4, 5. Types of female flowers.—6. A male flower.—7. A male flower opened out to show the anthers and the broad disc.—8. A fully expanded anther.—9. Vestiture.

All greatly enlarged, except where indicated.

Plate vi.

Notothixos subaureus Oliv.

1. Portion of a flowering and fruiting branch, four-fifths natural size.—2. N. Base of a young plant showing the union with the host. P.P. *Phrygilanthus eucalyptifolius*, four-fifths natural size.—3. A cymule of female and male flowers.—4. Cymule with the

flowers removed to show the deep notches.—5, 6. Types of female buds.—7, 8. Types of male buds.—9. Female flower.—10. Male flower.—11. A petal and a fully expanded anther.—12. Front view of anther.—13. Side view of anther.—14. Two pollen grains.—15. Fruit, four-fifths natural size.—16. Seed, four-fifths natural size.—17. Longitudinal section of seed to show the embryo.—18. A germinating embryo removed from the seed.—19. Germinating seed.—20. A very young plant, four-fifths natural size, showing the union with the host, two stipular-like bracts, and the two first leaves.

All greatly enlarged, except where indicated.

Plate vii.

Viscum Whitei, n. sp.

1, 2. Portion of a branch, four-fifths natural size.—3. Enlarged cymule of male and female flowers.—4. A female flower, enlarged.—5. Fruiting cymule, enlarged.

Plate viii.

Viscum Bancrofti, n. sp.

1. A young flowering and fruiting plant, four-fifths natural size.—2. Cymule of male and female flowers.—3. A cymule of female flowers showing the unequal development.—4. Male flower with the petals.—5. A remarkable form of proliferation of two female flowers.—6. One of the petals of the lower female flower of 5.—7. A trimerous female flower.—8. A bimerous female flower.—9. A male flower.—10. Male flower opened out.—10a. Petal showing the irregular anther.—11. A young male bud showing the reverse side of calyx to that of Fig. 2.—12. A fruiting cymule.—13. Fruit, four-fifths natural size.—14. Seed, four-fifths natural size.—15. A germinating seed with a very elongated hypocotyl.—16. A young plant showing the suctoral disc and cotyledons.—17. A very young plant, four-fifths natural size.

All greatly enlarged, except where indicated.

Plate ix.

Viscum angulatum Heyne.

1. Portion of a branch showing the flowers and fruits, four-fifths natural size.—2. Portion of a branch showing two female buds.—3. Branch showing two female and two male buds.—4. Two male buds within the cradle-like bract, showing the unequal size.—5. A male bud from the base of a female bud as in Fig. 3.—6. A trimerous male flower opened out to show the connate anthers.—7. A pair of female buds about half developed.—8. A terminal female bud about half developed.—9. A solitary female bud within the bract.—10. A very young bud showing the cradle-like bract in the early stages.—11. A trimerous female flower.—12. A tetramerous female flower.—13. Fruit.—14. Seed, about four-fifths natural size.—15. Seed enlarged.—16. A young hypocotyl enlarged to show the suctoral disc and the cotyledons.—17. A petal to show the connate anthers.

All greatly enlarged, except where indicated.